What is Claimed:

1. A method for designing a bi-connected ring-based network comprising:

receiving a list of locations where network traffic is at least one of originated and delivered;

receiving a list of pairs of directly connected locations, each defining a corresponding network traffic carrying connection including one or more signal carrying connections between each of the directly connected locations, and a capacity for each of the network traffic carrying connections;

receiving a list of traffic demand between each of the listed pairs of locations;

determining a dual homed cover including one or more dual homed cycles, each cycle comprising a closed loop sequence of directly connected locations and corresponding network traffic carrying connections, wherein each location, which is capable of being bi-connected, is included in at least one of the one or more dual homed cycles;

routing the traffic demand over the one or more cycles via the one or more of the network traffic carrying connections; and

at least one of outputting a report and storing a representation containing the designed bi-connected ring-based network.

2. A method in accordance with claim 1 additionally comprising after routing the traffic demand over the one or more cycles, adding additional traffic carrying capacity for each of the network traffic carrying connections where the routed traffic demand exceeds the available capacity.

3. A method in accordance with claim 2 wherein adding additional traffic carrying capacity includes adding additional signal carrying connections between the corresponding directly connected locations.

4. A method in accordance with claim 3 wherein adding additional signal carrying connections between the corresponding directly connected locations includes routing additional fiber or wire connections between two directly connected locations.

5. A method in accordance with claim 2 wherein adding additional traffic carrying capacity includes increasing the bandwidth of the existing signal carrying connections between the corresponding directly connected locations.

6. A method in accordance with claim 5 wherein increasing the bandwidth of existing signal carrying connections includes compressing multiple data streams onto the same signal carrying connection between the corresponding directly connected locations.

7. A method in accordance with claim 6 wherein compressing multiple data streams onto the same signal carrying connection includes transmitting each of the data streams using a different carrier frequency or wavelength.

8. A method in accordance with claim 1 wherein routing the traffic demand includes routing initially all the traffic traveling between two locations through the shortest effective route.

9. A method in accordance with claim 8, wherein the shortest effective route includes the route that traverses the fewest sequence of directly connected locations.

10. A method in accordance with claim 8 wherein a preference is given for routing traffic within the same cycle.

11. A method in accordance with claim 10 wherein the determination of the shortest effective route includes a weighted sum of the sequence of directly

connected locations where a transition between directly connected locations on different cycles is weighted so as to count as a transition between a predetermined number of directly connected locations on the same cycle, where the predetermined number exceeds the maximum number of locations on any of the determined cycles.

12. A method in accordance with claim 8 wherein routing the traffic demand additionally includes selectively routing at least some of the traffic demand through an alternative route comprising an alternative sequence of locations in order to minimize the maximum amount of traffic routed through any one of the network traffic carrying connections of each cycle.

13. A method in accordance with claim 1 wherein determining a dual homed cover includes:

finding a list of candidate cycles;

selecting one or more of the candidate cycles from the list.

14. A method in accordance with claim 13 wherein finding a list of candidate cycles includes finding a minimal length cycle for each unordered pair of locations.

15. A method in accordance with claim 14 wherein finding a list of candidate cycles additionally includes removing from the list of candidate cycles any redundant cycles.

16. A method in accordance with claim 14 wherein finding a list of candidate cycles additionally includes removing any cycles containing more than a predetermined maximum number of locations in the cycle sequence.

17. A method in accordance with claim 13 wherein selecting one or more cycles comprises:

rating each cycle;

selecting the best rated cycle;

determining if the selected cycles cover all the locations capable of being bi-connected;

if the selected cycles do not cover all of the locations capable of being bi-connected, selecting an additional cycle, which is bi-connected with at least one of the previously selected cycles, and which in combination with the previously selected cycles has the best rating, and

repeating the selection process for additional cycles until all locations capable of being bi-connected are covered.

18. A method in accordance with claim 17 wherein rating each cycle includes determining a an exhaust coefficient for each cycle in combination with any previously selected cycles.

19. A method in accordance with claim 18 wherein the exhaust coefficient for each cycle is equivalent to the sum of all thicknesses for the cycle being rated and the any previously selected cycles divided by the capacity of the cycle being rated and the any previously selected cycles.

20. A method in accordance with claim 19 wherein the thickness of each cycle is equivalent to the maximum one of an estimated network traffic traveling through each of the network traffic carrying connections between the corresponding directly connected locations of the corresponding cycle.

21. A method in accordance with claim 20 wherein the estimated network traffic traveling through each of the network traffic carrying connections is estimated by adding a proportionate amount of intra-ring traffic and inter-ring traffic dependent on the number of cycles including any previously selected cycles and the cycle to be rated, which contain one or more of the locations corresponding to the traffic demand between each of the listed pairs of locations.

22. A method in accordance with claim 1 wherein routing the traffic demand includes grooming the traffic demand assigned to the available signal carrying connections of the one or more cycles so as to minimize the amount of network traffic management equipment required for routing the traffic demand.

23. A method in accordance with claim 22 wherein grooming the traffic demand includes:

creating a list of traffic demand entries, where each traffic demand entry comprises a value of the volume of traffic and a sequence of network traffic carrying connections that the traffic traverses;

creating a list of signal carrying connections where each signal carrying connection comprises a traffic carrying capacity, a value corresponding to the amount of traffic already assigned, and a list of traffic management equipment supporting the already assigned traffic;

rating the traffic demand entries with respect to the signal carrying connections having unassigned capacity;

assigning the value of the volume of traffic associated with the traffic demand entry having the highest rating to the corresponding signal carrying connection having unassigned capacity;

recalculating the ratings of any traffic demand entries, where the value of the volume of traffic has not yet been assigned, and assigning the value of the volume of traffic associated with the traffic demand entry having the highest rating to the corresponding signal carrying connection having available unassigned capacity until all the traffic demand entries have been assigned.

24. A method in accordance with claim 23 wherein creating a list of traffic demand entries includes dividing into multiple traffic demand entries, individual traffic demand entries which traverse network traffic carrying connections of multiple cycles by separating into corresponding entries the portion of the sequence of network traffic carrying connections traversing an individual cycle.

25. A method in accordance with claim 23 wherein rating traffic demand includes determining whether the signal carrying connection has an amount of available capacity sufficient to accommodate the volume of traffic of the traffic demand entry.

26. A method in accordance with claim 23 wherein rating traffic demand includes assigning a routing preference to traffic demand entries corresponding to inter-ring traffic, as opposed to intra-ring traffic.

27. A method in accordance with claim 23 wherein rating traffic demand includes assigning a routing preference to traffic demand entries which require less additional traffic management equipment, than the traffic management equipment supporting the already assigned traffic, for routing the traffic of the traffic demand entry.

28. A method in accordance with claim 23 wherein rating traffic demand includes assigning a routing preference to traffic demand entries which minimizes the amount of traffic management equipment traversed, which is not required for routing the traffic of the traffic demand entry.

29. A method in accordance with claim 22 wherein grooming the traffic demand includes grouping network traffic originating from a common source location and being delivered to a common destination location onto the same signal carrying connections.

30. A method in accordance with claim 22 wherein the network traffic management equipment includes one or more of add-drop multiplexers and optical line terminals.

31. A method in accordance with claim 1 where in each of the one or more dual homed cycles has at least one location which is present in no other cycle.

32. A method in accordance with claim 1 wherein the traffic demand to be routed is determined by multiplying an already existing demand between each of the locations by a common multiple.

33. A method in accordance with claim 1 wherein the network is an optical network constructed using optical network components.

34. A method in accordance with claim 1 wherein the cycles are determined in conformance with SONET transmission protocols.

35. A method of designing networks comprising:

defining and storing a plurality of network nodes;

defining and storing a plurality of traffic limited links between the nodes;

defining a plurality of dual-homed communications rings formed of nodes joined by links;

specifying and storing system traffic;

allocating traffic on the links in accordance with link capacity to support the specified traffic; and

storing a representation of at least the rings in a writeable medium.

36. A method as in claim 35 which includes defining locations of traffic add/drop ports in accordance with a predetermined criterion.

37. A method as in claim 35 which includes displaying the rings in human discernable form.

38. A method as in claim 35 which includes specifying the rings in a multi-dimensional matrix and storing the matrix in a writeable medium.

39. A method as in claim 35 which includes representing the nodes and links as a graph having weighted edges wherein the weightings of the edges correspond to numbers of fibers in respective links.

40. A method as in claim 39 wherein the rings are selected in accordance with a pre-stored length criterion.

41. A method as in claim 39 wherein a pre-stored minimal length criterion is applied to the rings and wherein a set of minimum length rings is selected and stored.

42. A method as in claim 41 which includes storing the traffic as a matrix in a writeable medium.

43. A method as in claim 42 which includes establishing those rings which include first and second common nodes, and, allocating traffic between those nodes among those rings.

44. A method as in claim 43 wherein the traffic between those first and second nodes is allocated equally among those rings.

45. A method as in claim 43 which includes establishing rings which include a third node, but not a fourth node and those rings which include the fourth node but not the third node and allocating traffic between those nodes to the respective ones of those rings.

46. A method as in claim 43 which includes establishing a bandwidth parameter for each ring for traffic allocated thereon.

47. A method as in claim 46 which includes establishing a required bandwidth parameter for each link of each ring and storing same in a writeable medium.

48. A method as in claim 42 which includes selecting pairs of nodes shared by respective pairs of rings in support of inter-ring traffic.

49. A method as in claim 48 which includes selecting a minimal length traffic route between first and second nodes in accordance with a pre-determined criterion.

50. A method as in claim 49 which includes assigning a first weight to adjacent vertices in a selected ring and a greater weight to common vertices of first and second rings and wherein traffic between selected vertices is routed on a minimal weight path therebetween.

51. A method as in claim 50 wherein the traffic between selected rings is routed through each node of each selected pair shared by those rings.

52. A method as in claim 51 which includes locating traffic multiplexers at locations on selected rings where traffic is to be added or dropped.

53. A method as in claim 51 which includes locating traffic multiplexers at selected pairs of nodes shared between rings.

54. A method as in claim 52 which includes altering the traffic matrix and locating traffic multiplexers in accordance therewith.

55. A method as in claim 53 which includes altering the traffic matrix and locating traffic multiplexers in accordance therewith.

56. A method as in claim 51 which includes locating optical line terminals in accordance with traffic requirements.

57. A system comprising:

a processor of executable instructions;

an input device, coupled to the processor, for receiving specifying characteristics of a communication system;

a first plurality of executable instructions, coupled to the processor, for forming a plurality of connected rings wherein at least some of the rings share a common pair of nodes;

a second plurality of executable instructions wherein a minimum length set of rings, in accordance with a selected length criterion, is selected;

a third plurality of executable instructions for allocating traffic on the rings in accordance with at least one traffic matrix; and

an output device for communicating to a user the selected set of rings and the traffic allocated on the rings.

58. A system as in claim 57 which includes a plurality of instructions for weighting connecting links between nodes in accordance with numbers of available fibers.

59. A system as in claim 57 which includes instructions for determining placement of optical multiplexers.

60. Software for designing communications networks comprising:

a storage medium;

a first plurality of stored executable instructions for receiving information defining a network including a plurality of nodes joined by connecting communications links including an indicium of the number of communications paths in each link and a multi-dimensional representation of a traffic pattern;

a second plurality of stored, executable instructions for forming a biconnected representation of the network;

a third plurality of stored, executable instructions for forming a file defining connecting links between nodes; and

a fourth plurality of stored executable instructions for forming a traffic data file.

61. Software as in claim 60 which includes a plurality of instructions for forming a minimal set of dual-homed rings covering the network in accordance with a predetermined criterion.

62. Software as in claim 61 which includes a plurality of instructions for evaluating intra-ring traffic and inter-ring traffic.

63. Software as in claim 61 which includes a plurality of instructions for evaluating bandwidth requirements on links of the rings in response to the traffic data file.

64. Software as in claim 61 which includes a plurality of instructions for determining locations of at least one of optical multiplexers and optical terminals on the rings.

65. Software as in claim 62 which includes a plurality of instructions for minimizing traffic flow between rings.